IntesisBox®

PA-AC-MBS-1 v2.1

User's Manual

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Gateway for integration of Panasonic air conditioners into Modbus RTU (EIA485) control systems.

Compatible with Etherea line air conditioners commercialized by Panasonic.

Order Code: **PA-AC-MBS-1**

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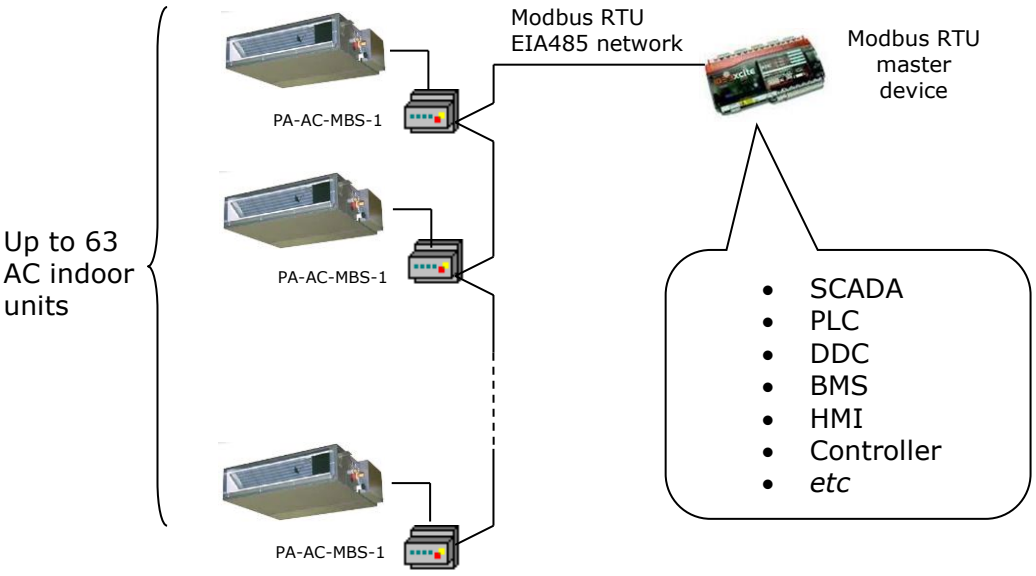
1 Presentation

The PA-AC-MBS-1 interface allows a complete and natural integration of ***Panasonic*** air conditioners into Modbus RTU (EIA485) networks.

Compatible with Domestic line models commercialized by PANASONIC

Main features:

- Reduced dimensions. 93 x 53 x 58 mm.
- Quick and easy installation. *Mountable on DIN rail, wall, or even inside the indoor unit in some models of AC*.
- External power not required.
- Direct connection to MODBUS RTU (EIA485) networks. Up to 63 PA-AC-MBS-1 devices can be connected in the same network. PA-AC-MBS-1 is a Modbus slave device.
- Direct connection to the AC indoor unit.
- Configuration from both on-board DIP-switches and MODBUS RTU.
- Total Control and Supervision. Real states of the AC unit's internal variables.
- Allows using simultaneously the IR and wired remote controls and MODBUS RTU.



2 Connection

The interface comes with a cable (1,9 meters long) for direct connection to the internal control board of the AC indoor unit.

- Connection of the interface to the AC indoor unit:

Disconnect mains power from the AC unit. Open the front cover of the indoor unit in order to have access to the internal control board. In the control board locate the socket connector marked as **CN-CNT**.

Using the cable that comes with the interface, insert one of its connectors, the one installed in the shortest uncovered part, into the socket of the PA-AC-MBS-1 marked as **AC Unit**, and the other connector, the one in the largest uncovered part, into the socket **CN-CNT** of the AC unit's control board. Fix the PA-AC-MBS-1 outside the AC indoor; remember that PA-AC-MBS-1 must be also connected to the MBS bus. Close the AC indoor unit's front cover again.

⚠ ***Important***: Do not modify the length of the cable supplied with the interface, it may affect to the correct operation of the interface

- Connection of the interface to the EIA485 bus:

Connect the EIA485 bus wires to the plug-in terminal block (the one of two poles) of PA-AC-MBS-1; respect the polarity on this connection (A+ and B-). Respect the maximum distance of 1.200 meters for the bus, no loop or star topologies are allowed for EIA485 bus, a terminator resistor of 120 must be present at each end of the bus to avoid signal reflections and also a fail-safe biasing mechanism (see section 3.7 for more details).

- Connections diagram:

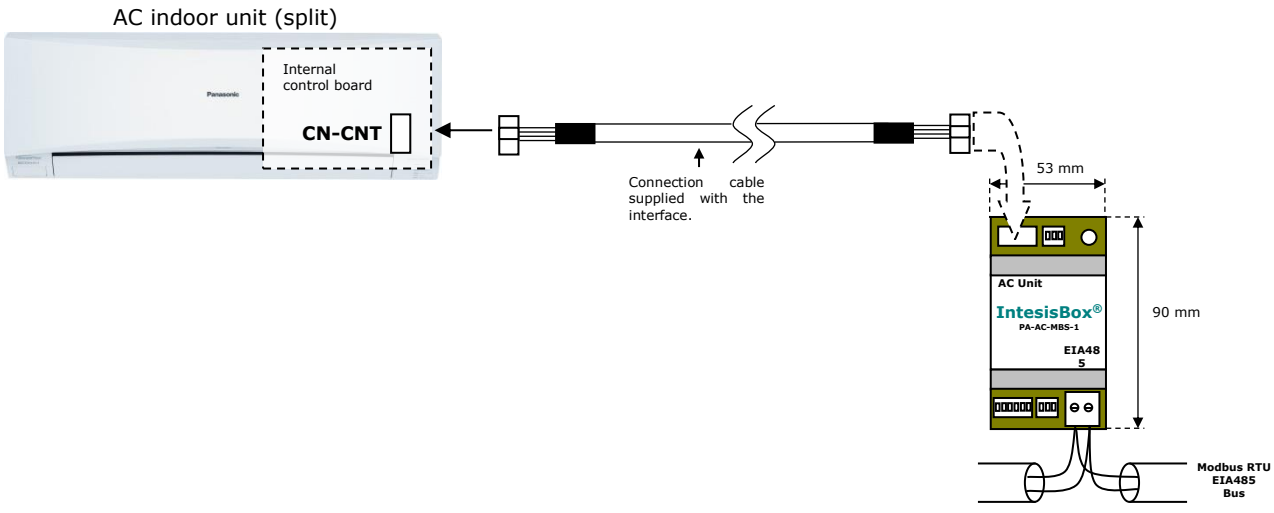


Figure 2.2 Connection diagram

3 Modbus Interface Specification

3.1 *Modbus physical layer*

PA-AC-MBS-1 implements a MODBUS RTU (slave) interface, to be connected to an EIA485 line. It performs 8N2 (8N1-compatible) communication (8 data bits, no parity and 2 stop bit) with several available baudrates (2400 bps, 4800 bps, 9600 bps -default- and 19200 bps).

3.2 *Modbus Registers*

All registers are of type "16-bit unsigned Holding Register", in standard Modbus' big endian notation.

3.2.1 Control and status registers

Register Address (protocol address)	Register Address (PLC address)	R/W	Description
0	1	R/W	AC unit On/Off ▪ 0: Off ▪ 1: On
1	2	R/W	AC unit Mode ▪ 0: Auto ▪ 1: Heat ▪ 2: Dry ▪ 3: Fan ▪ 4: Cool
2	3	R/W	AC unit Fan Speed ▪ 0: Auto ▪ 1: Low ▪ 2: Mid-1 ▪ 3: Mid-2 ▪ 4: Mid-3 ▪ 5: High
3	4	R/W	AC unit Vertical Vane Position ▪ 0: Auto ▪ 1: Horizontal ▪ 2: Position-2 ▪ 3: Position-3 ▪ 4: Position-4 ▪ 5: Vertical ▪ 6: Swing
4	5	R/W	AC unit Temperature Setpoint [1,2] ▪ 16..30ºC (ºC/x10ºC) ▪ 60..86ºF
5	6	R	AC unit Ambient Temperature [3] ▪ -10..38ºC (ºC/x10ºC) ▪ 50..100ºF
6	7	R/W	Window Contact ▪ 0: Closed ▪ 1: Open
7	8	R/W	Device Disablement ▪ 0: PA-AC-MBS-1 enabled ▪ 1: PA-AC-MBS-1 disabled

[1] Magnitude for this register can be adjusted to Celsius x 1ºC, Celsius x 10ºC (default) or Fahrenheit through DIP switch S4
[2] See section 3.2.3 for more information.
[3] Only available for 2013 models (PKE series) and onwards.

Register Address (protocol address)	Register Address (PLC address)	R/W	Description
8	9	R/W	IR Remote Command Disablement ▪ 0: Remote Command enabled ▪ 1: Remote Command disabled
9	10	R/W	AC unit Operation Time[4] Counts the time the AC unit is in "On" state. ▪ 0..65535 (hours).
10	11	R	AC unit Alarm Status ▪ 0: No alarm condition ▪ 1: Alarm condition
11	12	R	Error Code [5] ▪ 65535 (-1 if read as signed value): Status of AC error has not been obtained yet (initialization value) ▪ Any other: Error present.
22	23	R/W	AC ambient temperature from external sensor (at Modbus side) ▪ -32768: Default value. No temperature is being provided from an external sensor. ▪ Any other: (ºC/x10ºC/ºF)[6]
23	24	R	AC setpoint temperature [7] ▪ When no external temperature is provided, this read-only register will have same value as register 5 (PLC addressing). In all cases will show the current setpoint in the indoor unit. ▪ 16..32ºC (ºC/x10ºC)[6] ▪ 60..90ºF
26	27	R/W	AC unit Horizontal Vane Position ▪ 0: Auto ▪ 1: Horizontal ▪ 2: Position-2 ▪ 3: Position-3 ▪ 4: Position-4 ▪ 5: Vertical
38	39	R/W	Powerful ▪ 0: Off ▪ 1: On
39	40	R/W	Quiet ▪ 0: Off ▪ 1: On
56	57	R/W	Heat 8/10ºC Mode [7] ▪ 0: Off ▪ 1: On
57	58	R/W	ECO MODE [3] ▪ 0: Off ▪ 1: ECONAVI ▪ Auto Comfort
59	60	R	Human Activity [3] ▪ 0: Exist ▪ 1: Non Exist

[4] This value is stored in non-volatile memory
[5] See Section 6 for possible error codes and its explanation
[6] Magnitude for this register can be adjusted to Celsius x 1ºC, Celsius x 10ºC (default) or Fahrenheit through DIP switches S4
[7] Check your user manual to see if your unit has this feature.

61	62	R	Power Consumption [3] ▪ Value from expressed in W for current consumption of the AC unit.
65	66	R	Input reference temperature ▪ 0x8000: No temperature is being provided from an external sensor and no virtual temperature is applied. ▪ Any other: (ºC/x10ºC/ºF)
66	67	R	Return path temperature ▪ Temperature on the air return of the AC unit (ºC/x10ºC/ºF).

3.2.2 Configuration Registers

Register Address (protocol address)	Register Address (PLC address)	R/W	Description
13	14	R/W	"Open Window" switch-off timeout[8], ▪ 0..30 (minutes) ▪ Factory setting: 30 (minutes)
14	15	R/W	Modbus RTU baud-rate[9] ▪ 0: 2400 bps ▪ 1: 9600 bps (default) ▪ 2: 19200 bps ▪ 3: 57600 bps For this setting to take effect, DIP-switch S4-1 needs to be set in OFF position.
15	16	R/W	Device's Modbus slave address ▪ 1..63 ▪ Factory setting: 0 (no address / configured at DIP-switch)
50	51	R	Software version

[8] Once window contact is open, a count-down to switch off the AC Unit will start from this configured value
[9] This value is stored in non-volatile memory.

3.2.3 Considerations on Temperature Registers

- **AC unit Temperature Setpoint (R/W)** (register 5 – in PLC addressing): This is the adjustable temperature setpoint meant to be required by the user. This register can be read (Modbus function 3 or 4) or written (Modbus functions 5 or 16). A remote controller connected to the Panasonic indoor unit will report the same temperature setpoint value as this register only when no AC unit external reference is provided from PA-AC-MBS-1 (see detail for register 23 below).

- **AC unit ambient temperature (R)** (register 6 – in PLC addressing): This register reports the temperature that is actually used by the Panasonic indoor unit as reference of its own control loop. Depending on the configuration of the indoor unit, this can be the temperature reported by the sensor in in the return path of the Panasonic indoor unit or the sensor of its remote controller. It is a read-only register (Modbus functions 3 or 4).

- **AC unit external temperature reference (R/W)** (register 23 – in PLC addressing): This register allows providing an external temperature reference from Modbus side. Panasonic indoor unit does not directly allow for devices like PA-AC-MBS-1 to directly provide a temperature to be used as reference of the control loop of the AC indoor unit. In order to overcome that limitation and enable usage of an external temperature sensor (i.e. in Modbus side), PA-AC-MBS-1 applies following mechanism (if and only if "external reference temperature" is being used):

    - After a couple of values are entered in the "AC unit external reference temperature" (register 23) and "AC unit temperature setpoint" (register 5), PA-AC-MBS-1 will calculate the temperature demand they imply. (E.g. if a "temperature setpoint (register 5)" of **22ºC**, and an "external temperature reference (register 23)" of **20ºC** are entered, PA-AC-MBS-1 will assume that the user is demanding a **+2ºC** increase in temperature).

    - By knowing at all times the ambient temperature actually used by the indoor unit to control its own operation (register 6), PA-AC-MBS-1 can calculate the required setpoint so to apply the demand desired by the user (following the example above, if PA-AC-MBS-1 reads an "ambient temperature" (register 6) of **24ºC** in the indoor unit, it will apply a final setpoint of **24ºC + 2ºC = 26ºC**).

    - From this point on, whenever PA-AC-MBS-1 detects that the ambient temperature reported by the indoor unit changes (register 6), it will also change the required setpoint accordingly, in order to keep the demand required by the user at any time (following the example above, if PA-AC-MBS-1 receives a new value for temperature coming from the indoor unit of **25ºC**, PA-AC-MBS-1 will automatically adjust the setpoint required to the AC indoor unit to **25ºC + 2ºC = 27ºC**).

    - In general, PA-AC-MBS-1 is constantly applying the following formula:

$$S_{AC} = S_u - (T_u - T_{AC})$$

Where:

S_{AC} - setpoint actually applied to the indoor unit
S_u - setpoint written at Modbus side (register 5)
T_u - external temperature reference written at Modbus side (register 23)

T_{AC} - ambient temperature that the indoor unit is using as reference of its own control loop (register 6)

Whenever PA-AC-MBS-1 detects a change in any of the values of $\{ S_u , T_u , T_{AC} \}$, it will send the new corresponding setpoint (S_{AC}) to the indoor unit.

- After startup, value for "external temperature reference" (register 23) has value -32768 (0x8000). This value means that no external temperature is being provided through PA-AC-MBS-1. In this scenario, setpoint shown or written in register 5 will always have same value as the actual setpoint of the indoor unit.
- Note that, using the "external temperature reference" (register 23) (i.e. writing a value different from -32768 / 0x8000 in it) has following relevant consequences:
  - Setpoint reported by any additional remote controller or monitoring device from Panasonic connected to the indoor unit, in general will be different from the one entered in register 5 of PA-AC-MBS-1, since the mechanism above is being applied.
  - User will not be able to change setpoint using any remote controller from Panasonic, as setpoint of the indoor unit will become exclusively controlled by the mechanism explained above (i.e. the setpoint obtained in that mechanism will always be enforced in the indoor unit).

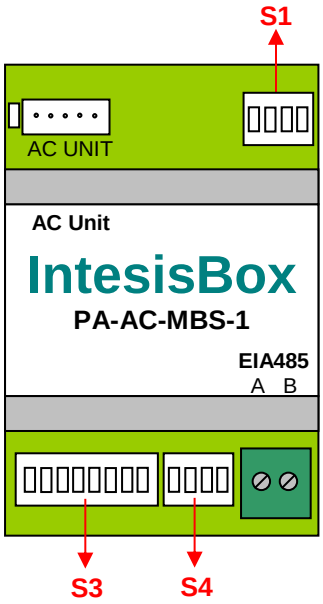
- **Current setpoint in AC indoor unit (R)** (register 24 – in PLC addressing)**:** As detailed in previous point, actual setpoint in the indoor unit and setpoint requested from PA-AC-MBS-1 might differ (when a value in register 23 – "external temperature reference" is put). This register always informs of the actual setpoint being used by the indoor unit – this is also the setpoint that will show an additional remote controller from Panasonic connected to the indoor unit, if present.

Additionally, note that temperature values all these three registers are expressed according to the temperature format configured through its onboard DIP-Switches (See "3.3 - DIP-switch Configuration Interface"). Following formats are possible:

- Celsius value: Value in Modbus register is the temperature value in Celsius (i.e. a value "22" in the Modbus register must be interpreted as 22ºC)
- Decicelsius value: Value in Modbus register is the temperature value in decicelsius (i.e. a value "220" in the Modbus register must be interpreted as 22.0ºC)
- Fahrenheit value: Value in Modbus register is the temperature value in Fahrenheit (i.e. a value "72" in the Modbus register must be interpreted as 72ºF (~22ºC).

3.3 *DIP-switch Configuration Interface*

All configuration values on PA-AC-MBS-1 can be written and read from Modbus interface. Though, some of them can also be setup from its on-board DIP-switch interface. The devices have DIP-switches S4, S1 and S3, in the following locations:



The following tables apply for configuration of the interface through these DIP-switches:

S1 – AC unit configuration: Fan mode and Horizontal Vanes mode selection

Binary value $b_3 \ldots b_0$	Decimal value	Switches 1 2 3 4	Description
0xxx	0	↓ x x x	AC unit does not have fan mode – Panasonic AC unit does not have fan mode available.
1xxx	1	↑ x x x	AC unit has fan mode (default value) – Panasonic AC unit has fan mode available.
x0xx	0	x ↓ x x	AC unit does not have horizontal vanes
x1xx	1	x ↑ x x	AC unit has horizontal vanes (default value).
xx0x	0	x x ↓ x	KEEP SWITCH IN THIS POSITION (default value)
Xx1x	1	x x ↑ x	DO NOT TURN SWITH INTO THIS POSITION (not applicable)
xxx0	0	x x x ↓	KEEP SWITCH IN THIS POSITION (default value)
xxx1	1	x x x ↑	DO NOT TURN SWITH INTO THIS POSITION (not applicable)

Table 3.1 S1 Switch configuration

S3 – Modbus protocol: Slave address and baudrate

Add	Switches 1 2 3 4 5 6 7 8	Add	Switches 1 2 3 4 5 6 7 8	Add	Switches 1 2 3 4 5 6 7 8	Add	Switches 1 2 3 4 5 6 7 8
0	↓ ↓ ↓ ↓ ↓ ↓ x x	16	↓ ↓ ↓ ↓ ↑ ↓ x x	32	↓ ↓ ↓ ↓ ↓ ↑ x x	48	↓ ↓ ↓ ↓ ↑ ↑ x x
1*	↑ ↓ ↓ ↓ ↓ ↓ x x	17	↑ ↓ ↓ ↓ ↑ ↓ x x	33	↑ ↓ ↓ ↓ ↓ ↑ x x	49	↑ ↓ ↓ ↓ ↑ ↑ x x
2	↓ ↑ ↓ ↓ ↓ ↓ x x	18	↓ ↑ ↓ ↓ ↑ ↓ x x	34	↓ ↑ ↓ ↓ ↓ ↑ x x	50	↓ ↑ ↓ ↓ ↑ ↑ x x
3	↑ ↑ ↓ ↓ ↓ ↓ x x	19	↑ ↑ ↓ ↓ ↑ ↓ x x	35	↑ ↑ ↓ ↓ ↓ ↑ x x	51	↑ ↑ ↓ ↓ ↑ ↑ x x
4	↓ ↓ ↑ ↓ ↓ ↓ x x	20	↓ ↓ ↑ ↓ ↑ ↓ x x	36	↓ ↓ ↑ ↓ ↓ ↑ x x	52	↓ ↓ ↑ ↓ ↑ ↑ x x
5	↑ ↓ ↑ ↓ ↓ ↓ x x	21	↑ ↓ ↑ ↓ ↑ ↓ x x	37	↑ ↓ ↑ ↓ ↓ ↑ x x	53	↑ ↓ ↑ ↓ ↑ ↑ x x
6	↓ ↑ ↑ ↓ ↓ ↓ x x	22	↓ ↑ ↑ ↓ ↑ ↓ x x	38	↓ ↑ ↑ ↓ ↓ ↑ x x	54	↓ ↑ ↑ ↓ ↑ ↑ x x
7	↑ ↑ ↑ ↓ ↓ ↓ x x	23	↑ ↑ ↑ ↓ ↑ ↓ x x	39	↑ ↑ ↑ ↓ ↓ ↑ x x	55	↑ ↑ ↑ ↓ ↑ ↑ x x
8	↓ ↓ ↓ ↑ ↓ ↓ x x	24	↓ ↓ ↓ ↑ ↑ ↓ x x	40	↓ ↓ ↓ ↑ ↓ ↑ x x	56	↓ ↓ ↓ ↑ ↑ ↑ x x
9	↑ ↓ ↓ ↑ ↓ ↓ x x	25	↑ ↓ ↓ ↑ ↑ ↓ x x	41	↑ ↓ ↓ ↑ ↓ ↑ x x	57	↑ ↓ ↓ ↑ ↑ ↑ x x
10	↓ ↑ ↓ ↑ ↓ ↓ x x	26	↓ ↑ ↓ ↑ ↑ ↓ x x	42	↓ ↑ ↓ ↑ ↓ ↑ x x	58	↓ ↑ ↓ ↑ ↑ ↑ x x
11	↑ ↑ ↓ ↑ ↓ ↓ x x	27	↑ ↑ ↓ ↑ ↑ ↓ x x	43	↑ ↑ ↓ ↑ ↓ ↑ x x	59	↑ ↑ ↓ ↑ ↑ ↑ x x
12	↓ ↓ ↑ ↑ ↓ ↓ x x	28	↓ ↓ ↑ ↑ ↑ ↓ x x	44	↓ ↓ ↑ ↑ ↓ ↑ x x	60	↓ ↓ ↑ ↑ ↑ ↑ x x
13	↑ ↓ ↑ ↑ ↓ ↓ x x	29	↑ ↓ ↑ ↑ ↑ ↓ x x	45	↑ ↓ ↑ ↑ ↓ ↑ x x	61	↑ ↓ ↑ ↑ ↑ ↑ x x
14	↓ ↑ ↑ ↑ ↓ ↓ x x	30	↓ ↑ ↑ ↑ ↑ ↓ x x	46	↓ ↑ ↑ ↑ ↓ ↑ x x	62	↓ ↑ ↑ ↑ ↑ ↑ x x
15	↑ ↑ ↑ ↑ ↓ ↓ x x	31	↑ ↑ ↑ ↑ ↑ ↓ x x	47	↑ ↑ ↑ ↑ ↓ ↑ x x	63	↑ ↑ ↑ ↑ ↑ ↑ x x

Table 3.2 S3 Modbus Slave address

Binary value $b_0…b_7$	Decimal value	Switches 1 2 3 4 5 6 7 8	Description
xxxxxx00	0	x x x x x x ↓ ↓	2400bps
xxxxxx10	1	x x x x x x ↑ ↓	4800bps
xxxxxx01	2	x x x x x x ↓ ↑	9600bps (- default value)
xxxxxx11	3	x x x x x x ↑ ↑	19200bps

Table 3.3 S3 Modbus baudrate

S4 – Temperature and termination: Degrees/Decidegrees (x10), temperature magnitude (ºC/ºF), number of fan speeds and EIA485 termination resistor.

Binary value $b_0…b_3$	Decimal value	Switches 1 2 3 4	Description
0xxx	0	↓ x x x	Temperature values in Modbus register are represented in degrees (x1) (default value)
1xxx	1	↑ x x x	Temperature values in Modbus register are represented in decidegrees (x10)
x0xx	0	x ↓ x x	Temperature values in Modbus register are represented in Celsius degrees (default value)
x1xx	1	x ↑ x x	Temperature values in Modbus register are represented in Fahrenheit degrees
xx0x	0	x x ↓ x	KEEP SWITCH IN THIS POSISIONT (default value)
xx1x	1	x x ↑ x	DO NOT TURN SWITH INTO THIS POSITION (not applicable).
xxx0	0	x x x ↓	EIA485 bus without termination resistor (default value)
xxx1	1	x x x ↑	Internal termination resistor of 120Ω connected to EIA485 bus**

Table 3.4 S4 Temperature and termination configuration

* Default value
** The termination resistor must only be activated in the interfaces connected at both ends of the bus, not in the rest. The EIA485 bus can be biased through internal jumpers JP2 and JP3. See section 3.7.

3.4 *Implemented Functions*

PA-AC-MBS-1 implements the following standard MODBUS functions:

- 3: Read Holding Registers
- 4: Read Input Registers
- 6: Write Single Register
- 16: Write Multiple Registers (Although this function is allowed, the interface does not allow write operations on more than 1 register with the same request, this means that length field should always be 1 when using this function for writes)

3.5 *Configuration of the device*

During first installation, it is necessary to appropriately set-up, at least, the following configuration parameters (in parenthesis its default / factory value):

- Modbus Slave Address (1)
- Modbus Baudrate (9600 bps)

All of them can be setup from both, Modbus registers or S4 and S3 DIP-Switch interfaces.

Device comes from factory with all DIP-Switches set at low level (all zero / position OFF↓). At this point, the device can be configured by following one of the two following methods:

- Start an EIA485 8N1 communication at 9600 bps with the device, and setup registers 15 (Slave Address) and 14 (Baudrate) by sending broadcast messages (with Slave Address field = 0). Note that PA-AC-MBS-1 always receives broadcast messages, though they are never answered back (to avoid collisions).
- Configure DIP-Switch interface using values shown in Section 3.3

Note that, setting up a different baudrate than 9600 bps must be done from Modbus interface. This implies that, once this value has been changed to another baudrate, Modbus interface will cease receiving data at previous baudrate (as new baudrate configuration immediately applies). So, immediately after changing baudrate configuration, remember to change the baudrate of the Modbus master communicating with PA-AC-MBS-1.

In case that it is desired to configure the interface using its Modbus configuration registers (instead of DIP-Switches), remember to keep all microswitches at low level (all zero / position ↓). Otherwise, configuration at DIP-Switches will prevail over the values configured at Modbus registers.

3.6 *Device LED indicator*

The device includes a LED indicator to signal its different possible operational states. In the following table are presented the different indications it can perform and its meaning.

Device status	LED indication	ON / OFF Period	Meaning
On power-up	LED pulse	ON for 5 seconds / OFF after	Device reset / power-up
During normal operation	LED flashing	200ms ON / 2s OFF	Device correctly configured and working
During normal operation	LED OFF	OFF continuously	No Modbus slave address configured
During normal operation	LED blinking	200ms ON / 200ms OFF	Communication Error with the AC unit

3.7 *EIA485 bus. Termination resistors and Fail Safe Biasing mechanism*

EIA485 bus requires a 120Ω terminator resistor at each end of the bus to avoid signal reflections.

In order to prevent fail status detections by the receivers *"listening"* the bus when all the transmitters outputs are in three-state (high impedance), it is also required a fail-safe biasing mechanism. This mechanism provides a safe status (a correct voltage level) in the bus when all the transmitters' outputs are in three-state.

The PA-AC-MBS-1 device includes an on-board terminator resistor of 120Ω that can be connected to the EIA485 bus by using DIP-switch S4 (see below).

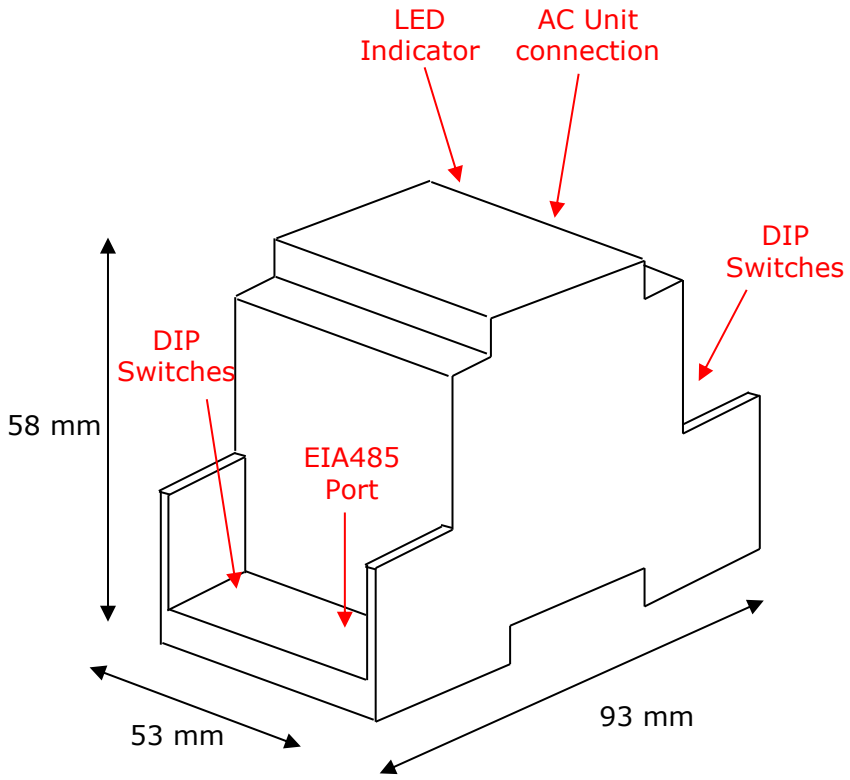
A fail safe biasing circuit has also been included in the board of PA-AC-MBS-1, it can be connected to the EIA485 bus by placing the internal jumpers JP2 and JP3 (see details below).
This fail safe biasing of the EIA485 bus must only be supplied by one of the devices connected to the bus. As this fail safe biasing circuit also provides a termination resistance, only one of both must be selected in the PA-AC-MBS-1 device, fail safe biasing (*jumpers JP2 and JP3 placed*) or terminator resistor (*DIP-switch S4 position 4 to ON*).

The device providing fail safe biasing or terminator resistor should be the one connected at one end of the bus. At the other end of the bus, if there is also a PA-AC-MBS-1 device, select the 120Ω terminator resistor through DIP-switch S4, or if there is a master device not providing internal 120Ω terminator resistor, connect an external 120Ω resistor in the bus terminal block connection of such master device.

Some Modbus RTU EIA485 master devices can provide also internal 120Ω terminator resistor and/or fail safe biasing (consult the technical documentation of the master device connected to the EIA485 network in every case).

4 Technical Specifications

Dimensions:	*93 x 53 x 58 mm*
Weight:	*85 g*
Operating Temperature:	*-40 . . . 85ºC*
Stock Temperature:	*-40 . . . 85ºC*
Operating Humidity:	*<95% RH, non-condensing*
Stock Humidity:	*<95% RH, non-condensing*
Isolation voltage:	*1000 VDC*
Isolation resistance:	*1000 MΩ*
Modbus Media:	*Compatible with Modbus RTU - EIA485 networks*



5 AC Unit compatibilities.

A list of Panasonic indoor unit models compatible with PA-AC-MBS-1 and their available features can be found in:

http://www.intesis.com/pdf/IntesisBox_PA-AC-xxx-1_AC_Compatibility.pdf

6 Error Codes

Error Code Modbus	Error in RC	Abnormality / Protection control	Abnormality Judgment	Problem	Check Location
0	H00	—	—	No error	—
65535 (-1 if signed)	—	—	—	Error in the communication of PA-AC-MBS-1 device with the AC unit	• Indoor/gateway connection wire
8209	H11	Indoor/outdoor abnormal communication	After operation for 1 minute	Indoor/outdoor communication not establish	• Indoor/outdoor wire terminal • Indoor/outdoor PCB • Indoor/outdoor connection wire
8210	H12	Indoor unit capacity unmatched	90s after power supply	Total indoor capability more than maximum limit or less than minimum limit, or number of indoor unit less than two.	• Indoor/outdoor connection wire • Indoor/outdoor PCB • Specification and combination table in catalogue
8212	H14	Indoor intake air temperature sensor abnormality	Continuous for 5s	Indoor intake air temperature sensor open or short circuit	• Indoor intake air temperature sensor lead wire and connector
8213	H15	Compressor temperature sensor abnormality	Continuous for 5s	Compressor temperature sensor open or short circuit	• Compressor temperature sensor lead wire and connector
8214	H16	Outdoor current transformer (CT) abnormality	—	Current transformer faulty or compressor faulty	• Outdoor PCB faulty or compressor faulty
8217	H19	Indoor fan motor mechanism lock	Continuous happen for 7 times	Indoor fan motor lock or feedback abnormal	• Fan motor lead wire and connector • Fan motor lock or block
8227	H23	Indoor heat exchanger temperature sensor abnormality	Continuous for 5s	Indoor heat exchanger temperature sensor open or short circuit	• Indoor heat exchanger temperature sensor lead wire and connector
8229	H25	Indoor E-Ion abnormality	Port is ON for 10s during E-Ion off	—	• E-Ion PCB
8231	H27	Outdoor air temperature sensor abnormality	Continuous for 5s	Outdoor air temperature sensor open or short circuit	• Outdoor air temperature sensor lead wire and connector
8232	H28	Outdoor heat exchanger temperature sensor 1 abnormality	Continuous for 5s	Outdoor heat exchanger temperature sensor 1 open or short circuit	• Outdoor heat exchanger temperature sensor 1 lead wire and connector
8240	H30	Outdoor discharge pipe temperature sensor abnormality	Continuous for 5s	Outdoor discharge pipe temperature sensor open or short circuit	• Outdoor discharge pipe temperature sensor lead wire and connector
8242	H32	Outdoor heat exchanger temperature sensor 2 abnormality	Continuous for 5s	Outdoor heat exchanger temperature sensor 2 open or short circuit	• Outdoor heat exchanger temperature sensor 2 lead wire and connector
8243	H33	Indoor / outdoor misconnection abnormality	—	Indoor and outdoor rated voltage different	• Indoor and outdoor units check
8244	H34	Outdoor heat sink temperature sensor abnormality	Continuous for 2s	Outdoor heat sink temperature sensor open or short circuit	• Outdoor heat sink sensor
8246	H36	Outdoor gas pipe temperature sensor abnormality	Continuous for 5s	Outdoor gas pipe temperature sensor open or short circuit	• Outdoor gas pipe temperature sensor lead wire and connector
8247	H37	Outdoor liquid pipe temperature sensor abnormality	Continuous for 5s	Outdoor liquid pipe temperature sensor open or short circuit	• Outdoor liquid pipe temperature sensor lead wire and connector

8248	H38	Indoor/Outdoor mismatch (brand code)	—	Brand code not match	• Check indoor unit and outdoor unit.
8249	H39	Abnormal indoor operating unit or standby units	3 times happen within 40 minutes	Wrong wiring and connecting pipe, expansion valve abnormality, indoor heat exchanger sensor open circuit	• Check indoor/outdoor connection wire and connection pipe • Indoor heat exchanger sensor lead wire and connector • Expansion valve and lead wire and connector
8257	H41	Abnormal wiring or piping connection	—	Wrong wiring and connecting pipe, expansion valve abnormality	• Check indoor/outdoor connection wire and connection pipe • Expansion valve and lead wire and connector.
8280	H58	Indoor gas sensor abnormality	Continuous for 6 hours	Indoor gas sensor open or short circuit	• Indoor gas sensor • Indoor PCB
8281	H59	ECO patrol sensor abnormality	Continuous for 70s	ECO patrol sensor open or short circuit	• ECO patrol sensor • ECO patrol and Indoor PCB
8292	H64	Outdoor high pressure sensor abnormality	Continuous for 1 minutes	High pressure sensor open circuit during compressor stop	• High pressure sensor • Lead wire and connector
8343	H97	Outdoor fan motor mechanism lock	2 times happen within 30 minutes	Outdoor fan motor lock or feedback abnormal	• Outdoor fan motor lead wire and connector • Fan motor lock or block
8344	H98	Indoor high pressure protection	—	Indoor high pressure protection (Heating)	• Check indoor heat exchanger • Air filter dirty • Air circulation short circuit
8345	H99	Indoor operating unit freeze protection	—	Indoor freeze protection (Cooling)	• Check indoor heat exchanger • Air filter dirty • Air circulation short circuit
12305	F11	4-way valve switching abnormality	4 times happen within 30 minutes	4-way valve switching abnormal	• 4-way valve • Lead wire and connector.
12311	F17	Indoor standby units freezing abnormality	3 times happen within 40 minutes	Wrong wiring and connecting pipe, expansion valve leakage, indoor heat exchanger sensor open circuit	• Check indoor/outdoor connection wire and pipe • Indoor heat exchanger sensor lead wire and connector • Expansion valve lead wire and connector.
12432	F90	Power factor correction (PFC) circuit protection	4 times happen within 10 minutes	Power factor correction circuit abnormal	• Outdoor PCB faulty
12433	F91	Refrigeration cycle abnormality	2 times happen within 20 minutes	Refrigeration cycle abnormal	• Insufficient refrigerant or valve close
12435	F93	Compressor abnormal revolution	4 times happen within 20 minutes	Compressor abnormal revolution	• Power transistor module faulty or compressor lock
12436	F94	Compressor discharge pressure overshoot protection	4 times happen within 30 minutes	Compressor discharge pressure overshoot	• Check refrigeration system
12437	F95	Outdoor cooling high pressure protection	4 times happen within 20 minutes	Cooling high pressure protection	• Check refrigeration system • Outdoor air circuit
12438	F96	Power transistor module overheating protection	4 times happen within 30 minutes	Power transistor module overheat	• PCB faulty • Outdoor air circuit (fan motor)
12439	F97	Compressor overheating protection	3 times happen within 30 minutes	Compressor overheat	• Insufficient refrigerant
12440	F98	Total running current protection	3 times happen within 20 minutes	Total current protection	• Check refrigeration system • Power source or compressor lock
12441	F99	Outdoor direct current (DC) peak detection	Continuous happen for 7 times	Power transistor module current protection	• Power transistor module faulty or compressor lock

In case you detect an error code not listed, contact your nearest Panasonic technical support service for more information on the error meaning.

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